

1   **CLAIMS:**

2   1. A motor assembly for a well pump, comprising:

3  
4       a motor;

5  
6       an electrical connector assembly on the motor having an insulator with a passage;

7  
8       an electrical conductor having an insulation layer on its exterior and extending from the  
9 motor into the passage of the insulator;

10  
11       the passage having an inner diameter that is larger than an outer diameter of the  
12 insulation layer, defining an annular cavity between the insulation layer and the inner diameter of  
13 the passage;

14  
15       an electrical connector joined to the electrical conductor within the passage; and

16  
17       an elastomeric debris seal around the insulation layer, the debris seal having a final size  
18 in which it seals around the insulation layer and blocks entry of debris into the annular cavity, the  
19 debris seal being of a material that swells upon contact with a dielectric fluid and has an having  
20 an initial size in which it does not seal the annular cavity to enable the dielectric fluid to flow  
21 into the annular cavity prior to the debris seal reaching the final size.

1 2.. The motor assembly according to claim 1, wherein the debris seal is located outside of the  
2 passage and in abutment with an end of the insulator.

3  
4 3. The motor assembly according to claim 1, wherein the debris seal comprises an O-ring.

5  
6 4. A motor assembly for a well pump, comprising:

7  
8 an upper motor,

9  
10 an upper adapter on a lower end of the upper motor having at least one upper adapter  
11 passage;

12  
13 an upper wire extending downward from the upper motor into the upper adapter passage;

14  
15 an upper electrical connector joined to a lower end of the upper wire;

16  
17 a lower motor;

18  
19 a lower adapter on an upper end of the lower motor that secures to the upper adapter and  
20 has at least one lower adapter passage;

21  
22 a lower wire extending upward from the lower motor into the lower adapter passage;

1 a lower electrical connector joined to an upper end of the lower wire for engaging the  
2 upper electrical connector;

3  
4 an elastomeric upper adapter debris seal in the upper adapter passage that seals around  
5 the upper wire to prevent debris from collecting around the upper wire and the upper electrical  
6 connector in the upper adapter passage; and

7  
8 the upper and lower motors containing a dielectric fluid in which the electrical connectors  
9 are immersed as well as both upper and lower sides of the debris seal.

10  
11  
12 5. The motor assembly according to claim 4, wherein the upper wire has an insulation layer on  
13 its exterior, and the debris seal sealingly engages the insulation layer.

14  
15 6. The motor assembly according to claim 4, wherein the debris seal comprises an annular  
16 member with an inner diameter that sealingly engages the upper wire and an outer diameter that  
17 sealingly engages an inner wall of the passage.

18  
19 7. The motor assembly according to claim 4, wherein the debris seal is formed of a material that  
20 swells due to contact with the dielectric fluid from an initial position in nonsealing engagement  
21 with the upper wire to a final position in sealing engagement with the upper wire.

1 8. The motor assembly according to claim 4, further comprising a tubular insulator located in the  
2 upper adapter passage and surrounding the upper wire; and wherein the debris seal is located  
3 above the insulator.

4  
5 9. The motor assembly according to claim 4, further comprising:

6  
7 a tubular lower insulator in the lower adapter passage surrounding the lower wire and  
8 having an upper portion extending upward from the lower adapter passage;

9  
10 a tubular upper insulator having an upper portion located in the upper adapter passage  
11 around the upper wire and a lower portion that inserts into overlapping engagement with the  
12 upper portion of the lower insulator; and

13  
14 a lower adapter debris seal located between the upper and lower portions of the insulators  
15 to prevent the entry of debris into the lower insulator.

16  
17 10. The motor assembly according to claim 9, wherein the upper and lower adapter debris seals  
18 comprise O-rings.

19  
20 11.. The motor assembly according to claim 4, further comprising a tubular insulator in the upper  
21 adapter passage into which the upper wire extends, the upper electrical connector sealing to the  
22 insulator, defining a lower end of a sealed annular cavity, the debris seal forming an upper end of  
23 the annular cavity, the annular cavity being filled with the dielectric fluid.

1  
2 12. A motor assembly for a well pump, comprising:

3  
4 an upper motor,

5  
6 an upper adapter on a lower end of the upper motor having at least one upper adapter  
7 passage;

8  
9 an upper insulator of a rigid insulating material located in the upper adapter passage and  
10 having a lower portion extending downward therefrom;

11  
12 an upper wire having an insulation layer on its exterior and extending downward from the  
13 upper motor into the upper insulator;

14  
15 an upper electrical connector joined to a lower end of the upper wire;

16  
17 an elastomeric upper adapter debris seal that seals around the insulation layer of the wire  
18 to prevent entry of debris between the insulation layer of the wire and an inner diameter of the  
19 upper insulator;

20  
21 a lower motor;

1 a lower adapter on an upper end of the lower motor that secures to the upper adapter and  
2 has at least one lower adapter passage;

3  
4 a lower insulator of a rigid insulating material located in the lower adapter passage and  
5 having an upper portion that extends upward therefrom and engages the lower portion of the  
6 upper insulator in an overlapping relation;

7  
8 a lower wire extending upward from the lower motor into the lower insulator;

9  
10 a lower electrical connector joined to an upper end of the lower wire and engaging the  
11 upper electrical connector; and

12  
13 a lower adapter debris seal located between the lower and upper portions of the upper and  
14 lower insulators to prevent entry of debris into the lower insulator.

15  
16 13. The motor assembly according to claim 12, wherein the upper adapter debris seal is located  
17 above the upper insulator and has an outer diameter that sealingly engages an inner diameter of  
18 the passage.

19  
20 14. The motor assembly according to claim 12, wherein the lower portion of the upper insulator  
21 extends concentrically into the upper portion of the lower insulator.

1 15. The motor assembly according to claim 12, wherein the upper and lower motors contain a  
2 dielectric fluid that immerses both upper and lower sides of each of the debris seals.

3  
4 16. The motor assembly according to claim 15, wherein the debris seals are formed of a material  
5 that swells when contacted with the dielectric fluid, and wherein the debris seals have an initial  
6 size prior to contact with the dielectric fluid that is nonsealing and a final size after contact with  
7 the dielectric fluid that seals.

8  
9 17. The motor assembly according to claim 12, wherein the upper electrical connector seals to  
10 the upper insulator, defining a lower end of a sealed annular cavity, the upper adapter debris seal  
11 forming the upper end of the annular cavity, the upper and lower motors and the annular cavity  
12 being filled with the dielectric fluid.

13  
14 18. A motor assembly for a well pump; comprising:

15  
16 an upper motor;

17  
18 an upper adapter on a lower end of the upper motor having at least one upper adapter  
19 passage;

20  
21 an upper insulator located in the upper adapter passage and having a lower portion  
22 extending downward therefrom;

1 an upper wire having an insulation layer on its exterior and extending downward from the  
2 upper motor into the upper insulator;

3  
4 the upper insulator having an inner diameter that is larger than an outer diameter of the  
5 insulation layer, defining an annular cavity between the insulation layer and the inner diameter of  
6 the upper insulator;

7  
8 an upper electrical connector having an upper portion that extends into the annular cavity  
9 and joins to a lower end of the upper wire, the upper electrical connector blocking a lower end of  
10 the annular cavity; and

11  
12 an elastomeric upper adapter debris seal that has a final size in which it seals around the  
13 insulation layer of the upper wire above the upper electrical connector and blocks entry of debris  
14 into the annular cavity, the debris seal being of a material that swells upon contact with a  
15 dielectric fluid and has an having an initial size in which it does not seal the annular cavity to  
16 enable the dielectric fluid to flow into the annular cavity prior to the debris seal reaching the final  
17 size.

18  
19 19. The motor assembly according to claim 18, wherein the debris seal comprises a ring that  
20 when at the final size has an inner diameter that seals to the insulation layer and an outer  
21 diameter that seals to an inner diameter of the upper adapter passage above the insulator.

22  
23 20. The motor assembly according to claim 18, further comprising:



1  
2 a lower motor;

3  
4 a lower adapter on an upper end of the lower motor that secures to the upper adapter and  
5 has at least one lower adapter passage;

6  
7 a lower insulator located in the lower adapter passage and having an upper portion that  
8 extends upward therefrom and engages the lower portion of the upper insulator in an overlapping  
9 relation;

10  
11 a lower wire extending upward from the lower motor into the lower insulator;

12  
13 a lower electrical connector joined to an upper end of the lower wire for engaging the  
14 upper electrical connector; and

15  
16 a lower adapter debris seal located between the lower and upper portions of the upper and  
17 lower insulators to prevent entry of debris into the lower insulator.

18  
19  
20 21. A method of operating a motor assembly for a well pump, comprising:

21  
22 providing a motor with an electrical connector assembly that has an insulator with a  
23 passage, an electrical conductor having an insulation layer on its exterior and extending from the

1 motor into the passage of the insulator, the passage having an inner diameter that is larger than  
2 an outer diameter of the insulation layer, defining an annular cavity between the insulation layer  
3 and the inner diameter of the passage, and an electrical connector joined to the electrical  
4 conductor within the passage;

5  
6 mounting an elastomeric debris seal around the insulation layer, the debris seal having a  
7 final size in which it seals around the insulation layer and blocks entry of debris into the annular  
8 cavity, the debris seal being of a material that swells upon contact with a dielectric fluid and has  
9 an having an initial size in which it does not seal the annular cavity to enable the dielectric fluid  
10 to flow into the annular cavity prior to the debris seal reaching the final size.

11  
12 placing an upper adapter debris seal around the insulation layer, the seal being of a type  
13 that swells upon contact with a dielectric fluid and has an initial size that does not seal to the  
14 wire; then

15  
16 drawing a vacuum on the interior of the motor and introducing a dielectric fluid into the  
17 interior of the motor, the initial size of the debris seal enabling dielectric fluid to flow past the  
18 debris seal into the annular cavity; then

19  
20 causing the debris seal to swell to seal around the insulation layer due to immersion in the  
21 dielectric fluid to seal the annular cavity; and

22  
23 supplying electrical power to the motor to cause it to operate.